A MOVEMENT STUDY OF BLACK BEARS IN THE VICINITY OF A WIND TURBINE PROJECT

SEARSBURG, VERMONT

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I BACKGROUND

In 1994, Green Mountain Power Corporation proposed to construct a 6 megawatt wind generation project in Searsburg, Vermont. Such a project required certification from the Vermont Public Service Board which scrutinized, among other things, potential impacts to critical wildlife habitat (functionally specific habitats critical to the survival of certain wildlife species). Critical habitat investigations of the project site and surrounding environs were conducted by Multiple Resource Management, Inc. (MRM) during the spring of 1995 and reported on in July of that year (Wallin 1995). Potential impacts to avian predators and migrating neo-tropical song birds were investigated separately by other researchers.

The only critical wildlife habitat found in the vicinity of the project was for black bear. Critical black bear habitat can take on three forms: mature American beech stands that provide fall mast necessary for building pre-hibernation fat reserves; forested wetlands that offer early feeding habitat immediately following emergence from their hibernacula; and travel corridors that offer access between seasonal feeding areas and/or travel lanes during the breeding season. No significant mature beech stands showing historic use by bears or forested wetlands were found within a half mile radius of the project area (Figure 1). Large blocks of mature beech do exist, however, to the southeast and to the west of the turbine site raising concern by the VT Department of Fish & Wildlife (VDFW) that the wind turbine project could disrupt movement of black bears between these habitat units.

VDFW records indicated the potential for three corridor crossings existing in or adjacent to the project area. One bear movement corridor is thought to come through the center of the project, one to the north and another to the south of the project. Loss of an access route between habitat blocks can fragment the habitat and

prevent future utilization. In this instance where 3 functional corridors interconnect the habitat blocks, VDFW concurred that bears could circumvent the project to the north or the south in the event the project displaced use of the center corridor. The corridor crossing Route 8 to the south is particularly secure in that the US Forest Service owns the property on either side of the highway, thus precluding roadside development from disrupting black bear migration. If the center corridor was to be jeopardized, however, VDFW suggested a monitoring program be conducted to document pre-development (1995) use of the corridor by bears, and determination of use during (1996) and after construction (1997).

II METHODS

MRM developed a technique for detecting bear movement through the area using a single strand of barbed wire. The wire was strategically strung from tree to tree through the woods at a height of 23 inches, the mean paw to shoulder height of captured black bears (VT Dept. of Fish and Wildlife, unpubl. data). At this height, the bear would be forced to either go over or under the wire with the hope of snagging a clump or individual strand of hair in the process. The wire had to be adjusted up or down the tree to accommodate for varying terrain.

Barbed wire was strung for one quarter mile to either side of what was thought to be the center of the corridor, a total run of one half mile. Initially, the fence was strung at the base of the ridge along Sleepy Hollow Road in an effort to document the movement from the ridge in one habitat unit to the ridge in the other habitat unit. After the fence was up and monitoring begun in the summer of 1995, concern was raised by VDFW that this may not reveal avoidance of the turbines once they were built at the top of the ridge, approximately 1,500 feet away. Bears would have the opportunity to cross Route 8, get picked up by the fence, and then make a low elevation end-run north or south to avoid crossing the immediate turbine area at the top of the ridge; though bears may

continue to use the corridor, we would not know if bears were avoiding the ridgetop where the turbines would be located. Consequently, a second half-mile fence was erected just below the ridgetop on the west face that would be only 200 to 500 feet from the turbines.

An inspection schedule was developed in consultation with VDFW whereby the fences were walked every other week and inspected for hair snagged in the barbs of the wire. Inspection of the wire typically began the first week of May and continued through the first week in December or when snow conditions prevented inspection of the wire, which ever came first. Hair found on the wire was removed and deposited in collection envelopes for positive species identification through microscopic analysis (Moore et al. 1969, Adorjan and Kolensky 1980).

III DEVIATIONS

Plans for the transmission line corridor were reviewed prior to constructing the lower fence in an effort to avoid a siting conflict. Design changes in the transmission corridor, however, resulted in its relocation and subsequent need to rebuild the lower fence in the spring of 1996. The original fence was removed before all 1995 snag locations could be mapped.

The replacement fence utilized a heavier gage wire than the original fence. This was done in an attempt to achieve greater durability, however, concern soon arose that hair snags were not as secure on the heavier 12 gage wire as on the lighter 15 gage wire. For comparative purposes, a parallel fence was erected from 15 gage wire to see if there was any significant difference in hair retention between the two fences of different gage wire.

After clearing began in the spring of 1996, it became apparent that the upper fence did not extend all the way north to the first turbine site, consequently, the upper fence was extended another ¼

mile in the spring of 1996.

IV RESULTS

Pre-Construction - 1995

The first fence was in place along Sleepy Hollow Road and ready for inspection by the first week in May, 1995. At this time, the project was still in the final design and permitting phase.

The first snag of bear hair was found on the second inspection trip, May 18, 1995. The snag was left on the fence in order to determine how long the hair could be expected to remain entangled in the barb. This clump of hair remained snared on the barb until the fence was taken down the following year. In all, 11 separate bear snags were found on the lower fence between the initial inspection on May 8th and the final inspection on December 3rd (see Table 1).

The upper fence was not erected until the end of August, 1995. This fence did yield 4 bear crossings before the end of the inspection season.

Year of Construction - 1996

Land clearing for the project began in early spring, 1996. By the end of April, clearing began of the transmission line paralleling Sleepy Hollow Road. Despite efforts to construct the bear fence beyond the limits of the transmission line, relocation of the line required removal and subsequent reconstruction of the fence.

Both fences were ready for inspection by early May, 1996. Only one bear was picked up during the spring/summer portion of the monitoring season and that crossing was made on the upper fence. Five more bear crossings were documented during the fall, 4 on the upper fence and 1 on the lower fence for a total of only 6 bear crossings documented during this year of construction (Table 1).

The new replacement fence was constructed out of 12 gage wire versus the 15 gage of the original fence. It was noted, however, that the hairs were not as substantially impinged in the coil of the 12 gage barbed wire due to manufacturing differences of the two gages. Suspicion arose as to whether bears may have gone undetected due to hair falling off or not being snagged at all. Plans were made to erect a second lower fence prior to the 1997 monitoring season from 15 gage wire parallel to the existing 12 gage fence. Presumably, the fences would be so close together that a bear crossing the site would have to traverse both fences and provide a comparison of snag success between the two gages.

Post Construction - 1997

Completion of the wind turbine project was delayed due to a few start-up difficulties, consequently, construction activity persisted into the spring of 1997. The first bear crossing was found on the June 5th inspection with a bear snag on both the upper and lower fences. By the end of the season, 21 crossings were documented, 13 on the upper fence and 8 on the lower fence (Table 1). Of the 8 lower fence crossings, 4 were on the 12 gage wire and 4 on the 15 gage wire and never was there a snag at both wires on any one inspection day.

V DISCUSSION

First glance at the results would suggest a classic *no impact (1995)-impact (1996)-no impact (1997)* influence on bear movement through the project area during the *pre-construction-construction-post-construction* periods. This may certainly be the case, however, other uninvestigated variables may have played a role. Availability of food, for example, can influence whether a bear will seek out a specific habitat site. The project is located between 2 prominent beech stands that can offer a rich food source in both the fall when the nuts ripen and again in spring if the fall crop produced a surplus. A poor mast crop can result in bears moving to other habitats such as forested wetlands when they emerge

from the den; such action would preclude bears moving through the project area which may account for the lack of activity during 1996. In all likelihood, however, the decline in movement during 1996 can be more closely related to the high degree of construction activity. Certainly the dramatic increase in bear movement during 1997 (equal to 1995 and 1996 combined, see Figure 2) can not be ignored and likely suggests that operation of the project is within the local bear population's threshold of tolerance. It is possible that the first sight of the project (after crossing the upper wire) is such a shock to the bear that it never returns, however, such a theory can not be documented without extended post-construction monitoring to determine longer term trends in behavior.

With the erection of the upper fence, it was thought that a snag found on the lower fence would automatically imply a snag would be found on the upper fence as the bear moved from the top of the ridge to the valley or vice versa. Surprisingly, this never happened until the third year of monitoring and then only twice. This same phenomena happened between the two lower fences of different gage. Here, the fences were only 5 to 50 feet apart for a half mile reach and yet when bear hair was found on one fence, there was no corresponding snag on the other. Close scrutiny of the fences in the suspected path that the bear may have taken revealed a low or high spot in the fence with no snag due to extreme topographic changes, fallen log, etc. that may have provided passage without catching a strand of hair. The double lower fence results suggests that the success rate of snagging bears may be as low as 50%. Since bear hair was found 4 times on each gage, it would suggest that there is no difference in the effectiveness of the different gages, though sample size is too small to be conclusive.

A project site plan was generated using Global Positioning System (GPS) equipment so that the fences could be shown in relationship to the wind turbine locations (Figure 3). Each snag location on

the fences was then plotted with GPS to see if the actual corridor could be defined. Regretfully, the original lower fence was removed in the spring of 1996 before the 1995 snag locations could be positioned with the GPS equipment, consequently, Figure 3 does not contain 1995 lower fence snag locations.

It was originally theorized, and now appears to be a reasonable assumption, that the bears were likely moving through the saddle between the two ridges upon which the turbines are situated. The access road intersection at the top of the ridge is in this saddle with turbines 1 through 7 on the north ridge and turbines 8 through 11 on the south ridge (see Figures 1 and 3). The clustered snags on the upper fence show a pattern developing with three main avenues of approach to the saddle between the ridges while the snags on the lower fence are more diffused.

The barbed wire proved to be a productive means of monitoring bear movement through the project. Care needs to be taken during erection of the fence to ensure that it conforms to the contour of the ground. Though some bears traversing the project site are likely missed by the wire, using the same upper fence throughout the study and the same lower fence for the latter two years provides frequency of crossing numbers that should be relative for the site. These numbers appear to lead towards the conclusion that black bear behavior patterns may have been disrupted during the peak of construction, however, first year post-construction operation and maintenance of the wind turbines does not appear to disrupt historic movement patterns.

TABLE 1 . UPPER AND LOWER MONITORING FENCE SNAGS OF BLACK BEAR HAIR FOR 1995, 1996 & 1997

1995			1996			1997			Upper Fence Snags			
Date ('95) Inspected	Upper Fence	Lower Fence	Date ('96) Inspected	Upper Fence	Lower Fence	Date ('97) Inspected	Upper Fence	Lower (wire) Fence (gage)	Date Inspected	1995 Snags	1996 Snags	1997 Snags
08-May		0	10-May	0	0	14-May	0	0	E-Jun			1
18-May		1	29-May	0	0	23-May	0	0	M-Jun			
29-May		1	31-May	0	0	05-Jun	1	1 (12)	L-Jun		1	
05-Jun		0	21-Jun	1	0	18-Jun	0	1 (15)	E-Jul			3
21-Jun		0	03-Jul	0	0	04-Jul	3	0	M-Jul			1
27-Jun		0	16-Jul	0	0	16-Jul	1	0	L-Jul			
07-Jul		3	30-Jul	0	0	01-Aug	1	0	E-Aug			1
24-Jul		1	24-Aug	0	0	18-Aug	0	2 (12)	M-Aug			
26-Jul		0	11-Sep	0	0	05-Sep	2	0	L-Aug			
16-Aug		0	25-Sep	0	0	16-Sep	3	0	E-Sep			2
22-Aug		0	14-Oct	0	0	05-Oct	1	2 (15)	M-Sep			3
07-Sep	0	0	24-Oct	0	0	17-Oct	0	0	L-Sep			
19-Sep	0	1	08-Nov	1	0	31-Oct	0	0	E-Oct	3		1
01-Oct	3	0	18-Nov	0	1	16-Nov	1	1 (15)	M-Oct	1		
16-Oct	1	0	06-Dec	3	0	29-Nov	0	1 (12)	L-Oct			
29-Oct	0	1							E-Nov		1	
15-Nov	0	3							M-Nov			1
03-Dec	0	0							L-Nov			0
									E-Dec		3	
TOTALS	4	11		5	1		13	8	TOTALS	4	5	13
									(E- early, M- mid, L- late month)			

LITERATURE CITED

Adorjan, A.S., and G.B. Kolensky. 1969. A manual for the identification of hairs of selected Ontario mammals. Ontario Ministry of Natural Resources, Research Report (Wildlife) No. 90.

Moore, T.D., L.E. Spence, and C.E. Dugnolle. 1974. Identification of the dorsal guard hairs of some mammals of Wyoming. Wyoming Game and Fish Department, Bulletin No. 14.

Wallin, J.A. 1995. Impacts to cricial wildlife habitats from a proposed wind turbine project, Searsburg, Vermont. Multiple Resource Management, Inc. Leicester, VT. 13 pp.

FIGURE 1 Critical Black Bear Habitats In The Vicinity Of The Wind Turbines

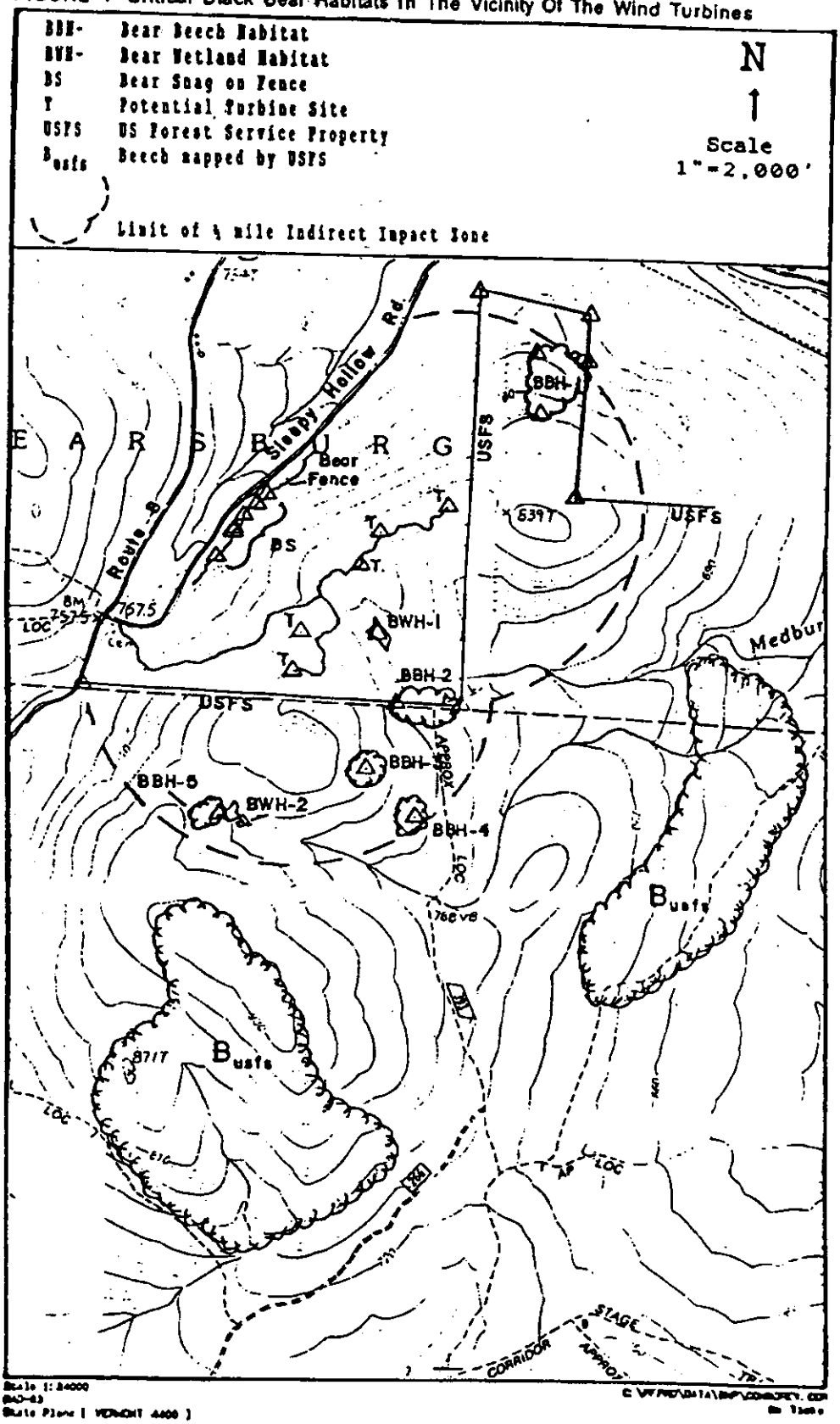


FIGURE 2

Bear Snags on Upper & Lower Fence
Before (1995), During (1996) & After (1997) Construction

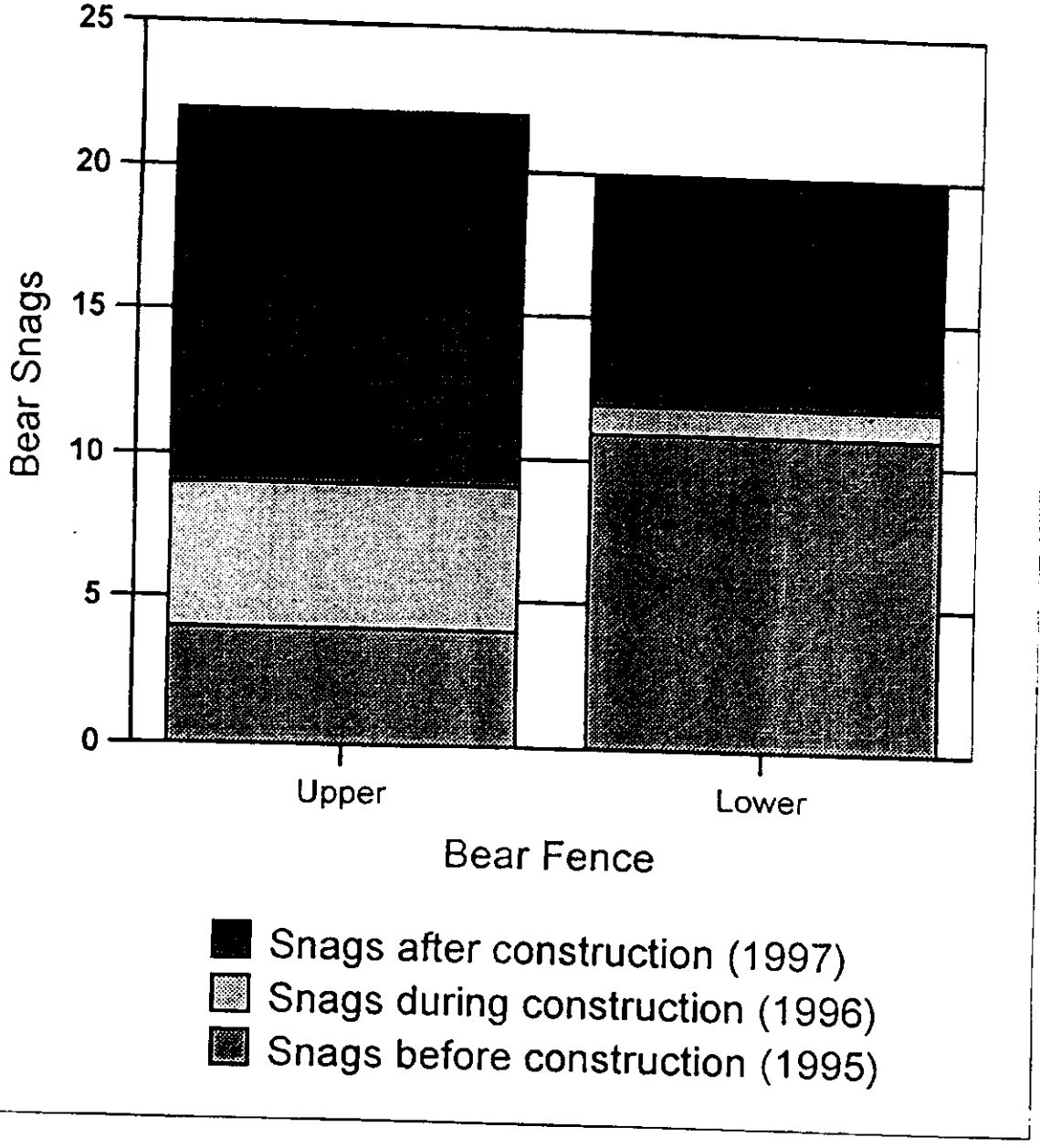
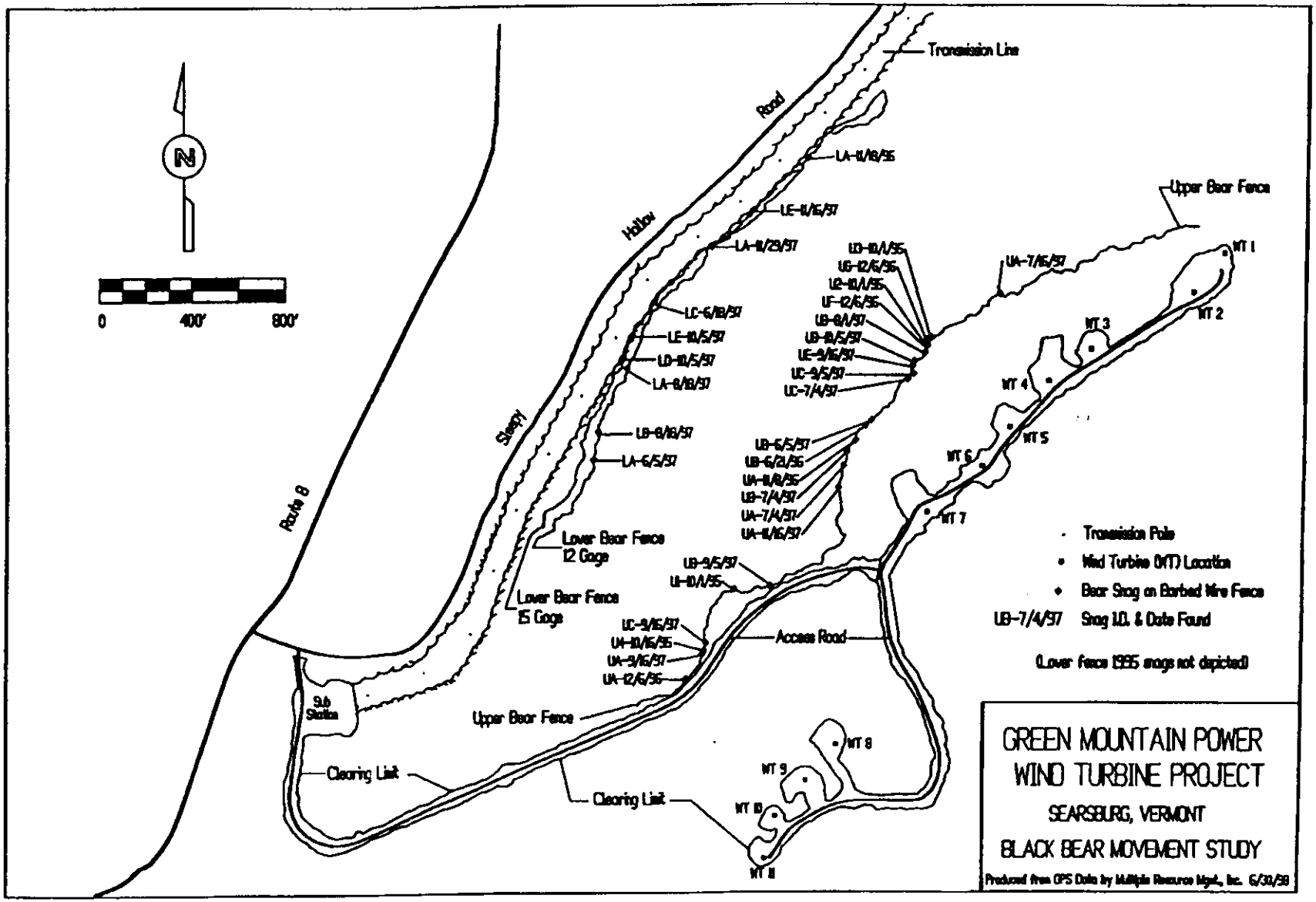
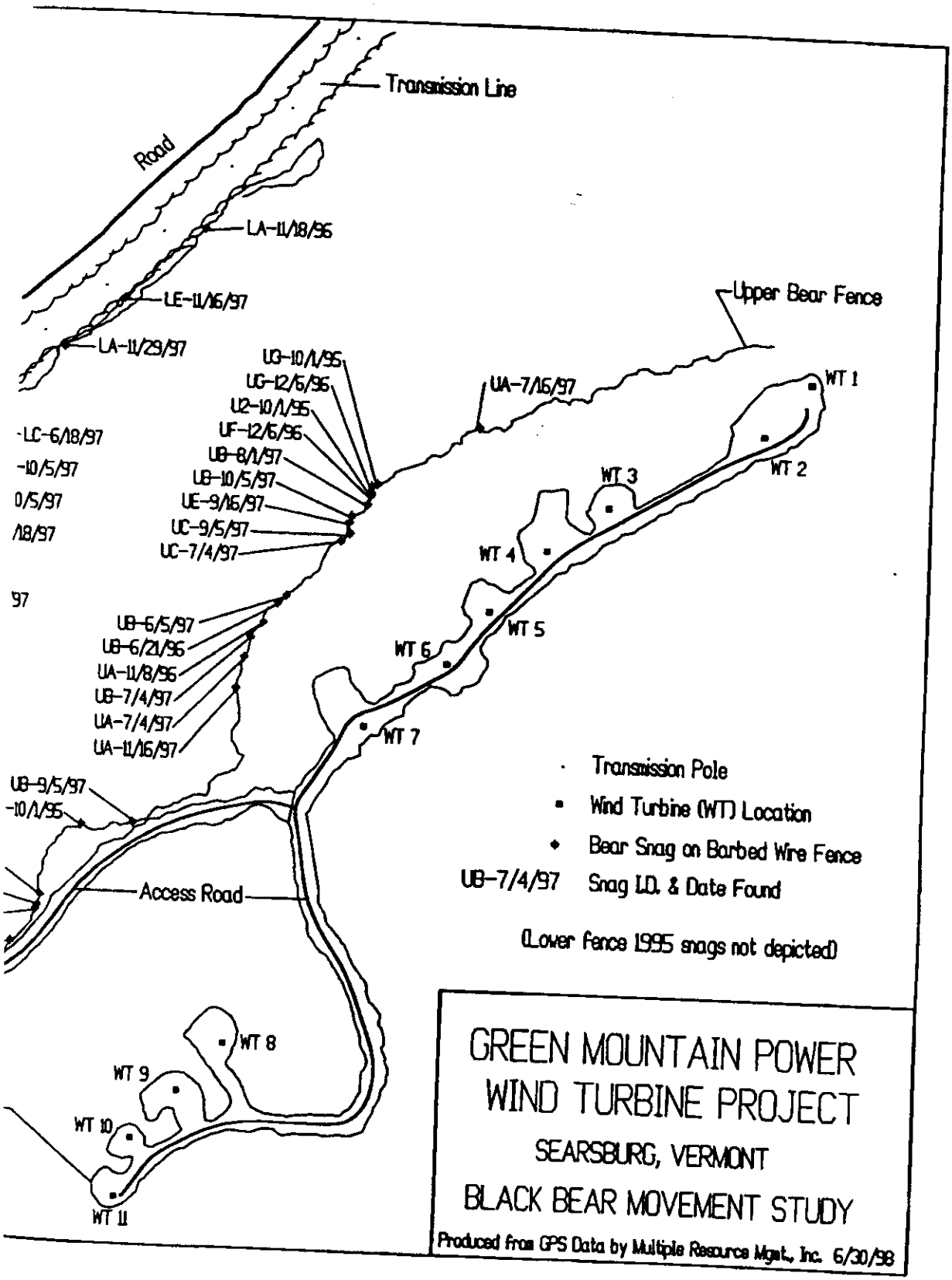


FIGURE 3 Wind Turbine Project Layout and Black Bear Fence Snag Locations





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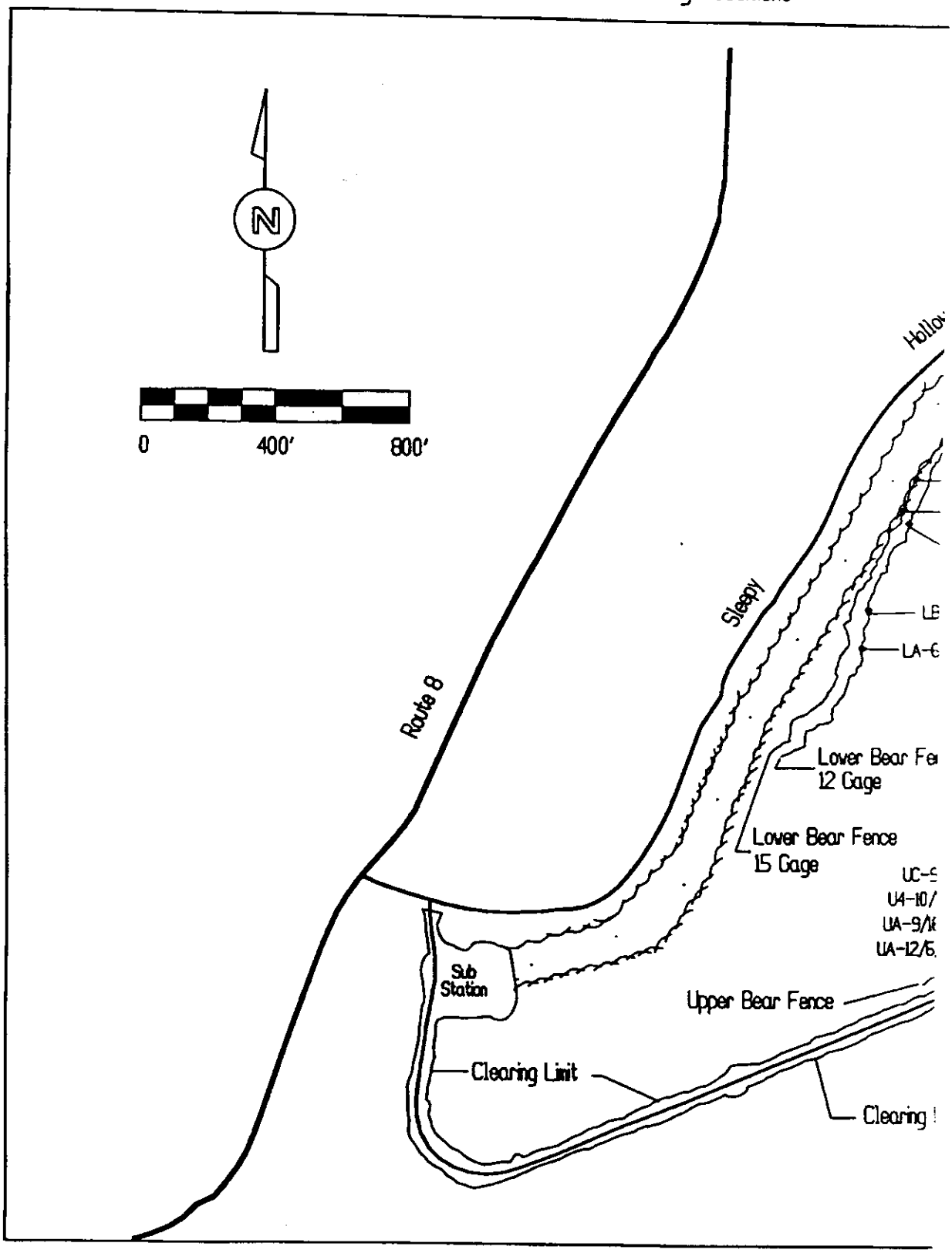

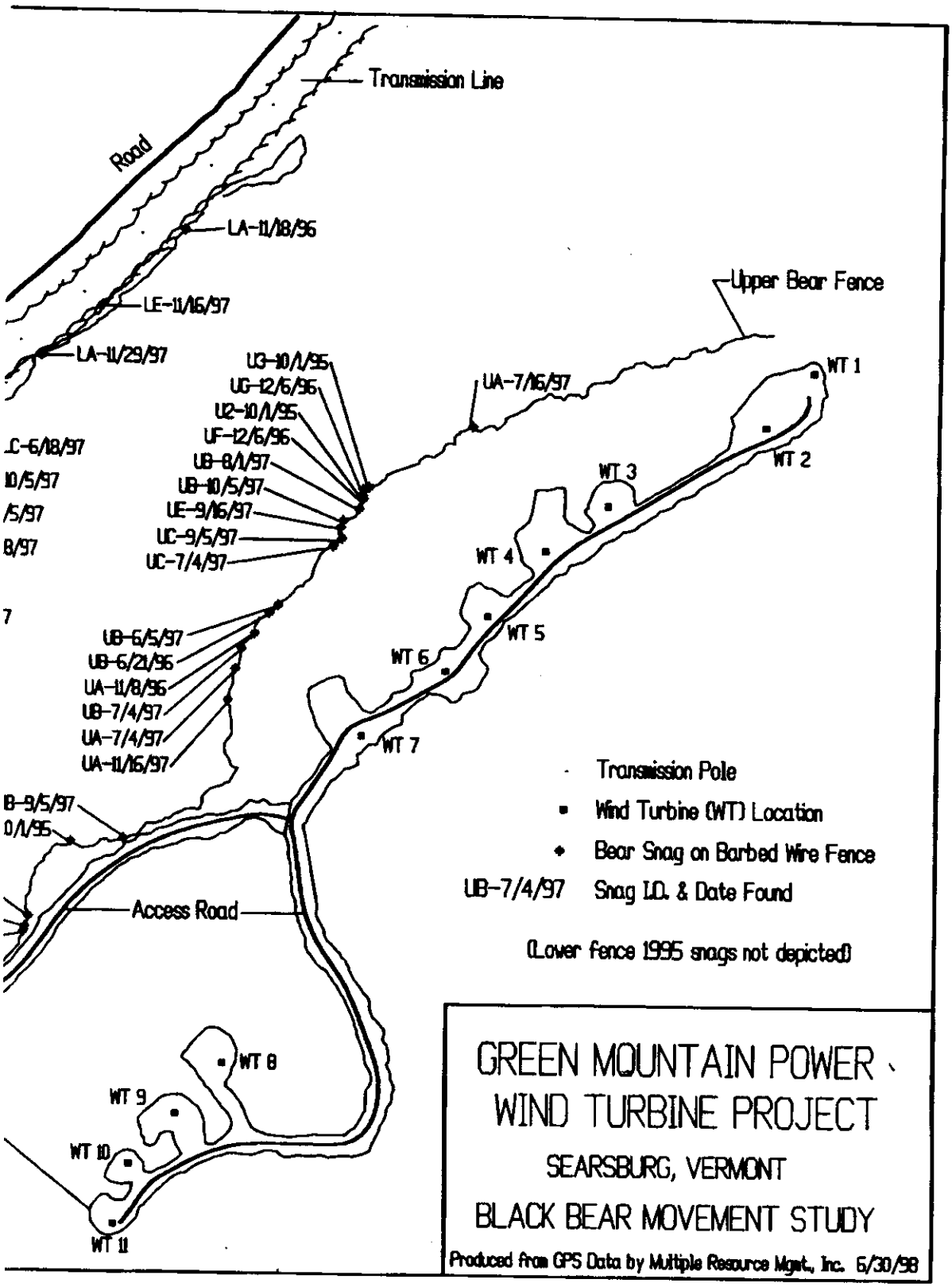
Transmission Line
Road
LA-11/18/96
LE-11/16/97
LA-11/29/97
Upper Bear Fence
UA-7/16/97
WT 1
WT 2
WT 3
WT 4
WT 5
WT 6
WT 7
WT 8
WT 9
WT 10
WT 11
UB-6/5/97
UB-6/21/96
UA-11/8/96
UB-7/4/97
UA-7/4/97
UA-11/16/97
UC-9/5/97
UC-7/4/97
UE-9/16/97
UB-10/5/97
UB-8/1/97
UF-12/6/96
U2-10/1/95
UG-12/6/96
U3-10/1/95
Access Road
Transmission Pole
Wind Turbine (WT) Location
Bear Snag on Barbed Wire Fence
UB-7/4/97 Snag I.D. & Date Found
(Lower fence 1995 snags not depicted)
GREEN MOUNTAIN POWER
WIND TURBINE PROJECT
SEARSBURG, VERMONT
BLACK BEAR MOVEMENT STUDY
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